COMMITTEE ON GOVERNMENT REFORM

SUBCOMMITTEE ON ENERGY AND RESOURCES
DARRELL ISSA, CHAIRMAN

Oversight Hearing:
"The Next Generation Nuclear Plant and Hydrogen Production: A Critical Status Report"
September 20, 1:00 p.m.
Room 2154 Rayburn Building

BRIEFING MEMORANDUM

SUMMARY:

In January 2006, Chairman Issa requested that the Government Accountability Office complete a study to assess the Department of Energy's (DOE) progress in meeting its schedule for design and construction of the Next Generation Nuclear Plant (NGNP) by 2021, as well as DOE's approach to ensure the commercial viability of the project. An operational NGNP will demonstrate advanced, next generation technologies for generating electricity and producing hydrogen on a large-scale for use in fuel cells for automobiles and the transportation sector.

The Energy Policy Act of 2005 set additional requirements and milestones for completion of the NGNP, including the selection of design parameters in 2011. In addition, the NGNP will require a license for construction and operation from the Nuclear Regulatory Commission, and DOE and the NRC must jointly submit a licensing strategy to Congress in 2008. Research and development work on the NGNP are being conducted primarily at the Idaho National Laboratory.

Of particular concern in the NGNP project is the development of a number of technologies that will ensure project milestones are met and construction will be completed on schedule. Meeting the timetable provides a high probability—but not a guarantee—that the demonstration plant will be of use to the private sector and not overtaken by other commercial technologies that may be developed sooner.

In addition, delays in meeting milestones will call into question the decision for continued support of the NGNP considering other nuclear priorities such as the Nuclear 2010 and Global Nuclear Energy Partnership programs that require considerable federal financial support.

This hearing will coincide with the release of the GAO study and assess the progress and outlook for successful completion of the NGNP.

Program Background

Nuclear power is enjoying a global renaissance because of its environmental benefits and the expected growth in demand for electricity. In the US, there is also newfound interest in building new plants as the current fleet of reactors ages and electricity demand is projected to rise 40-50 percent by 2030.

The NGNP is part of a federal government effort to advance commercial nuclear reactor designs to offer safety and improvements over the current generation of nuclear power plants that are being deployed around the world. US efforts in advanced design R&D are part of its participation in the Generation IV International Forum.[1] Additionally, the NGNP is a key component in the Administration's plans to develop the "hydrogen economy" because an associated purpose of the advanced nuclear demonstration plant is to produce hydrogen on a large scale.

Development of the NGNP began in 2003, and the research and development on the new reactor is being conducted primarily at the Idaho National Laboratory. The Department of Energy is supporting research on several reactor concepts but priority has been given to the very-high temperature, gas-cooled reactor.

The NGNP is envisioned as a full-scale demonstration plant that will establish the commercial feasibility of a number of technologies, including fuel fabrication, passive safety design, and advanced reactor design. The Department of Energy estimates that the total cost for the plant, from R&D to construction and production of hydrogen, is approximately $2.5 billion. The Energy Policy Act of 2005 stipulates that the plant must be constructed and operational by September 30, 2021.

Reactor Design

The very-high temperature reactor is the favored design in the US due to its potential for competitive cost use in secondary industrial activities such as hydrogen production and desalinization. The reactor design and operations will be more advanced than other high temperature reactors because of its large size and projected operating temperature that should enable it to use enough "process" heat to produce hydrogen in quantity and at an economically competitive cost.

Current technologies are based on boiling water or pressurized water reactors that are also cooled by water. Water is reactive and highly corrosive, causing high maintenance costs and costly safety systems. Water can flash into radioactive steam in case of a failure, requiring expensive containment facilities as a safety precaution.

Gas-cooled reactors rely on passive systems and the fabrication of the reactor fuel to avoid uncontrolled nuclear reactions. Advancements in fuel fabrication and design are purported to enable safer operation and continuous fueling, rather than requiring reactor shutdowns as with current designs.

[1] Generation IV refers to the next generation of reactors that are expected to hit the market. Reactors that are currently being constructed are based on Generation III technologies.

Schedule and Funding

The Energy Policy Act of 2005 set scheduling requirements for the development of the NGNP, effectively setting milestones that the Department of Energy, the Idaho National Laboratory, and the Nuclear Regulatory Commission must meet. DOE and the Nuclear Regulatory Commission must submit a licensing strategy for the NGNP to Congress by August 2008 so that a construction and operating license can be obtained according to schedule. DOE is to conduct R&D and select design parameters for the plant by September 30, 2011, and an operational NGNP must be in place by the end of September 2021. To meet these deadlines, DOE and INL have developed plans for R&D on fuels, materials, and hydrogen production. External advisory committees to DOE have expressed reservations regarding DOE's planning and have suggested acceleration of the schedule to ensure that other technologies do not supersede those developed as part of the NGNP and commercialization does not become a secondary issue.

The main source for NGNP funding is DOE's Generation IV Nuclear Energy Systems Initiative. Through 2006, DOE budgeted about $120 million in R&D funding, of which $80 million is for nuclear and $40 million for hydrogen production. For FY 2007, the Administration requested $31.4 million for the Gen IV Initiative. The House-passed funding bill met the Administration request for Gen IV by reducing funding for the NGNP from $40 million to $23.4 million. The Senate Appropriations Committee reported $48 million for the Gen IV program and continued level funding of $40 million for NGNP.[2]

Program Challenges

Continued funding is clearly a challenge for the NGNP because of the duration of the program and its overall cost. In addition, the Administration requested $250 million as part of the new Global Nuclear Energy Partnership (GNEP). GNEP seeks to achieve breakthroughs in recycling nuclear fuel as part of a new nuclear non-proliferation strategy by having nations with secure, advanced nuclear capabilities provide fuel services to other nations who agree to employ nuclear energy for power generation purposes only.

The Administration's prioritization of GNEP, combined with the Nuclear 2010 program,[3] has called into question its commitment to NGNP completion. Congress is also challenged with funding nuclear disposal and storage activities, and the continued delay in completing the permanent facility at Yucca and controversy regarding expensive interim storage solutions has further complicated matters. The Appropriations Committees have struggled with funding these programs against a backdrop of continually changing Administration nuclear priorities. Long-term survival of the NGNP program may be more threatened by a lack of political support than technological hurdles.

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[2] CRS Report for Congress, *Nuclear Energy Policy*, July 20, 2006.

[3] The Nuclear 2010 program will pay up to half of the nuclear industry's costs of seeking regulatory approval for new reactor sites, applying for new reactor licenses, and preparing detailed plant designs. The program is intended to provide assistance for advanced versions of existing commercial nuclear plants that could be ordered within the next few years.

Cancellation of the NGNP would severely endanger the fulfillment of the "hydrogen economy" that the President touted only a few years ago.

ISSUES TO BE ADDRESSED AT THE HEARING:

- What are the technological challenges to completing the NGNP?
- Can the Department of Energy and the Idaho National Laboratory meet the completion deadline, and is the plan sufficient to meet the goals of the NGNP?
- Will the technologies utilized in the NGNP be commercially feasible and meet the needs of the private sector?

WITNESSES:

Mr. Jim Wells, Director, National Resources and Environment, Government Accountability Office

Mr. Phil Hildebrandt, Idaho National Laboratory, Special Assistant to the Laboratory Director

Dr. Andrew Kadak, Professor, Nuclear Science and Engineering Department, Massachusetts Institute of Technology

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